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ABSTRACT

In light of the transition from a labor- to a knowledge-intensive economic system, member countries of the Organization for Economic Cooperation and Development (OECD) seem to have little choice but to increase the efficient allocation of both the quality and flow of knowledge and literacy skills. To reduce risks and counter the factors that otherwise might lead to underinvestment in human capital, a new human capital accounting system is needed that would aim at measuring and recording levels of competency. In particular, it would focus on the acquisition of knowledge and competency relevant to the workplace. A general survey of workers' knowledge and skills offers the possibility of directly testing how these are related to productivity. Such information would begin to create a more solid basis for policy on education and training. To test the relationship between competence and productivity, the samples should be designed to measure both competence and productivity for the same respondents. This implies collecting data in work settings. The primary sampling units should be firms or work establishments. Another desirable feature of the sampling design would be to sample clusters of entire work groups within enterprises. The following challenges must be overcome to accomplish the study design: establish a definition of skill and develop a skill taxonomy; develop reasonably accurate test measures; collect data; and include the time dimension and reference period for measurement. (Contains 43 references.) (YLB)

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NCAL

NATIONAL CENTER ON ADULT LITERACY

ADULT BASIC SKILLS IN OECD COUNTRIES:

POLICY ISSUES AND A RESEARCH AGENDA

David Stern
Albert Tuijnman
Centre for Educational Research and Innovation (CERI)
Organisation for Economic Co-operation and Development (OECD)

OECD/NCAL INTERNATIONAL PAPER IP94-01
NOVEMBER 1994

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CENTRE FOR EDUCATIONAL RESEARCH AND DEVELOPMENT

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The National Center on Adult Literacy (NCAL) was established in 1990 by the U.S. Department of Education, with co-funding from the Departments of Labor and Health and Human Services. The mission of NCAL addresses three primary challenges: (a) to enhance the knowledge base about adult literacy; (b) to improve the quality of research and development in the field; and (c) to ensure a strong, two-way relationship between research and practice. Through applied research and development and dissemination of the results to researchers, policymakers, and practitioners, NCAL seeks to improve the quality of adult literacy programs and services on a nationwide basis. NCAL serves as a major operating unit of the Literacy Research Center at the University of Pennsylvania.

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Abstract

This report considers a sequence of three questions: How might national and international surveys contribute to a better understanding of the relationship between schooling and adult basic skills, and second, between basic skills and dependent variables such as labor force participation, unemployment, and worker productivity? Further, what kinds of samples and instruments should be created to achieve this potential gain in understanding? Finally, what must be done in order to accomplish the desired study design?

LITERACY AS A KEY VARIABLE IN ECONOMIC ANALYSIS

The publication, *Adult Illiteracy and Economic Performance* (OECD, 1992), opens with the following statement:

> This . . . first OECD study on adult illiteracy . . . appears at a time when advanced industrialized countries are starting to worry seriously about illiteracy, having previously considered it largely a problem for developing nations. The underlying reason for this new concern is suggested precisely by CERI's work on human resources and technological change: it is not that schools are turning out demonstrably less literate graduates than in the past, but that the ways in which adults need to apply literacy skills are becoming far more demanding. But the phenomenon of illiteracy in industrialized countries is as yet relatively little studied or understood . . . . (p. 7)

This paragraph places literacy squarely in an economic context, characterized by concern over skill demand and supply in industrialized countries. A skills mismatch is seen as harmful, because it diminishes the value added by technology and reduces the productivity of workers and firms. This, in turn, strains the competitiveness of firms, labor markets, and the nation as a whole. By noting that the phenomenon of illiteracy in this context is little studied, however, the reader of the 1992 study is warned that the relationship between literacy and competitiveness needs further study and that the OECD report offers no truths but rather hypotheses for investigation.

The investigation is taken further in the present report, which explores a number of hypotheses concerning the relationships between schooling attainments, literacy skills, productivity, and competitiveness (see also Berryman, 1994). The research literature is reviewed, not as an end in itself, but as a necessary step in summarizing the questions posed by policymakers, identifying the main knowledge gaps, and proposing an agenda for data collection and analysis.

Despite the scarcity of evidence, the claim that worker skills are a major ingredient in economic competitiveness has found a large and receptive audience among policymakers and researchers and has helped propel the issue of literacy to the fore of the policy debate in OECD countries. The interest in literacy thus derives from an argument about the role of skills in influencing productivity. This argument is at the heart of a debate over whether and why Western economies have performed below expectations since the late 1970s. Some economists have postulated that misallocated and insufficient skills explain, at least partly, why the cumulative input of capital, labor, and technology has produced less than the expected economic growth in Western economies. This argument focuses attention on the role of intangible variables such as the knowledge, skills, and competencies of workers, information, and social and cultural capital in influencing the marginal productivity of other factors of production. Workplace literacy has moved to center stage because it is believed to confer economies of scale to capital and labor inputs. Economic growth, it is

argued, depends not only on the amounts of tangible input factors but especially on their optimal allocation, given the strongly diminishing returns on investment in intangibles. Because intangible capital is associated with people and organizations, productivity growth cannot be separated from worker skills and the quality of interpersonal relationships that occur as microphenomena in the workplace.

In conclusion, the widespread concern with literacy derives from the key role of human competence in some micro-based models of macroeconomic growth (Eliasson, 1993). The OECD countries seem to have little choice but to increasingly seek their global competitive advantage in the accumulation of skills and competence (Bengtsson, 1991). However, the conversion of financial capital into human capital—and hence the development of a knowledge-intensive economy—is a slow, gradual, and risky process. Risks arise because the payoff of investments in literacy is not self-evident and immediate. In order to reduce risks and counter the factors that otherwise might lead to underinvestment in human capital, a new concept of human capital accounting is needed.

A new human capital accounting system would aim at measuring and recording levels of competency—for example, adult basic skills. In particular, it would focus on the acquisition of knowledge and competency relevant for use in the workplace. The potential benefits of an effective human capital accounting system are legion (Miller, 1994):

- facilitating incremental and long-term investment in human capital by validating existing assets, by providing greater assurance of later market validation, and by facilitating the removal of rigidities stemming from arbitrary market power entrenched by tradition or outdated regulations;
- promoting labor mobility;
- opening new opportunities for firm-based financial accounting and reporting of human capital;
- clarifying the ownership of competency;
- increasing the transparency of labor contracts; and
- increasing flexibility and encouraging human capital investment by validating labor contracts.

Although not falling strictly under the banner of human capital accounting, plans to introduce a *minimum start qualification* currently being implemented in Germany, the Netherlands, and other OECD countries can be seen as examples of a policy interest in the validation or certification of knowledge and skill. Similar initiatives can be noted elsewhere, such as the Canadian initiatives in official *prior learning assessment and standards setting*, the proposed *certificate of initial mastery* in the United States, the introduction of *national vocational qualifications* in the United Kingdom, the establishment a *vocational certificate training system* in Australia, and the creation in 1987 of *assessment centers* in France. These strategies all seek to optimize labor allocation and the conversion of financial into intangible capital by improving the signaling and information functions of education and labor markets.

Ideally, in order to establish a new concept of human capital accounting, information is needed not only on the literacy profiles of individual workers, occupations, firms, and labor markets but also on the costs of and returns from investment in skill acquisition. This focuses attention on the relationships between schooling and literacy skills and between literacy skills and productivity. Indeed, the entire analysis stands or falls on the hypothesis that investment in skills makes workers and firms more productive.

POTENTIAL GAINS FROM SURVEYS

SCHOOLING AND LITERACY SKILLS

In the absence of direct observations on the skills and competence of people in the labor force, sociologists and economists often consider using proxy variables such as the number of years of schooling completed or the highest credential attained. This may be admissible insofar as knowledge and skills correlate highly with measures of completed schooling. However, a serious threat to validity can arise if schooling and skills do not correspond. Such a situation can occur for a variety of reasons. For example, people who enter the labor market with similar educational qualifications have not necessarily acquired the same level of proficiency in literacy skills or competency in interpersonal relations. Furthermore, discrepancies can arise because people do not stop learning upon leaving school. Because the opportunity to learn varies depending on a host of personal, situational, and economic variables, the relationship between initial schooling and the literacy skills of workers is not necessarily linear. Whether educational attainment can nevertheless be employed as a proxy for acquired skills depends on what questions are addressed and what type of data analysis is undertaken.

Educational attainment is also conventionally employed as a variable predicting the individual and social outcomes of schooling. The possible effects of education can be measured in different ways and at different levels. Microscopic studies tend to focus on variables that carry meaning for individuals, for example, the incidence of unemployment, occupational opportunity, sex differences in the labor market, worker productivity, or earnings from work. By contrast, macroscopic studies are concerned with the effects of education on the supply of skilled workers, the functioning of labor markets, and aggregate economic growth. In both cases, empirical work is guided not only by the hypothesized relationship between the dependent variables and educational attainment per se, but also by an assumption concerning the relationship between the dependent variables and the knowledge, skills, and competence that are believed to be associated with schooling attainment.

In the OECD countries, most people have received a minimum of formal schooling. Until recently, schooling was generally assumed to be congruent with proficiency in basic literacy skills. Questions about skill deficits were therefore almost exclusively directed to certain marginalized groups. This position changed, albeit gradually, with the publication of surveys of adult basic skills conducted in Canada and the United States during the mid- and late-

1980s. Literacy assessments undertaken in a handful of other countries have since confirmed that measures of completed schooling are, at best, poor substitutes for direct assessments of worker skills.

Whereas data sets have been assembled in a number of OECD countries, there still is a dearth of empirical information at the international level. The absence of comparable information limits the possibility of establishing benchmarks for the thresholds of literacy proficiency. It also hampers the testing of hypotheses concerning the value of schooling and, particularly, the relationship between education, literacy skills, and worker productivity.

Literacy Skills and Worker Productivity

A positive correlation between individuals' schooling attainment and earnings has been demonstrated by hundreds of statistical studies (Psacharopoulos, 1985). The additional earnings associated with higher education in particular grew during the 1980s in most OECD countries (OECD, 1993, p. 171), and this fact has been the major piece of evidence supporting the widespread current claim that skill requirements in the workplace are increasing.

However, these findings leave some fundamental questions unanswered. As pointed out above, schooling attainment per se is not a measure of knowledge or skill. Ever since Arrow (1973) and Spence (1973) demonstrated that labor markets might well reward higher educational attainment even if schools contributed nothing to individual productivity, the extent to which schools operate as a screening mechanism has remained an open question. If ability is assumed to be a one-dimensional construct, then schools in theory might be certifying only individuals' ability; employers are willing to pay more to persons so certified, even if these persons learned nothing in school that increased their productivity. In contrast, if ability is multidimensional—for example, linguistic, musical, logical-mathematical, spatial, and bodily-kinesthetic (Gardner, 1985)—and if certain jobs require more of some abilities than of others, then schools may be helping individuals to sort themselves into different kinds of jobs (Willis & Rosen, 1979), without necessarily adding to their productive knowledge or skill. How much of the monetary return due to schooling represents payment for competencies acquired in school remains an open question.

Continuing education and training complicate the matter even further. The specification of continuing education and firm-based training as mediating variables in a model sequencing the effect of schooling on occupation and earnings causes the size of the parameters associated with the influences of schooling to decrease substantially. The specification of measures of continuing education and training, moreover, changes the shape of the curves associated with the schooling effect; the capacity of schooling to predict occupational status and earnings from work decreases at an earlier age than would be the case if such variables were ignored (Tuijnman, 1989). Thus, the effect of schooling on earnings is partly spurious, since omitted variables such as postinitial learning also influence this relationship. This evidence provides strong support for theories of lifelong learning. In addition, it suggests that it is necessary to go behind simple measures of educational

attainment and to assess more directly the knowledge, skills, and competencies that may be associated with productivity and earnings growth.

A further reason why the correlation between earnings and schooling fails to tell us much about the relationship between skills and productivity is that earnings and productivity are by no means synonymous. Lazear (1981), for example, demonstrated that competitive labor markets might award higher pay to individuals with more seniority, even if their productivity remained absolutely constant over time. OECD (1973) had already noted that the prospect of higher pay later in life would keep young noses to the grindstone and would keep more senior workers from shirking because they would not want to risk dismissal while in their highly paid years. Individuals are therefore more productive than they would be if they were paid exactly the value of what they produced as they went along, and the resulting gain in lifetime productivity would benefit both employers and employees. Lazear's model does seem to fit certain situations where employment relationships are expected to last a long time, as in large Japanese manufacturing companies or large U.S. law firms. In general, then, we cannot assume that individual earnings are highly correlated with productivity.

The purpose of this discussion is not to summarize the literature on education as a screening device or the relationship between pay and productivity, but rather to indicate that these overarching questions preclude a simple interpretation of the association between schooling and earnings. In order to understand whether, how, and to what extent workers' competence affects their productivity, studies of schooling attainment and earnings will never suffice. It is necessary to measure productivity and competence directly. This line of reasoning offers strong arguments for looking very carefully at the dimensions of literacy skills and competencies, how they are acquired, and how they bear on production.

Aggregate growth/accounting studies (e.g., Denison, 1962; Jorgenson, 1984) tell us even less than statistical studies at the individual level about how competence affects productivity. Although these studies are interpreted as measuring the contribution of education to economic growth at the national level, they are based on the assumption that higher earnings of more highly educated people are a measure of their higher productivity. As we have seen, that assumption is questionable.

Industry studies, though still highly aggregated, have yielded more direct evidence that higher average levels of education are correlated with higher productivity (Bishop, 1990; Blakemore & Hoffman, 1989; Daly, 1986; Griliches & Mason, 1972). Bartel and Lichtenberg (1987) found more demand for educated workers in industries using newer technology and spending more on research and development, indicating that the contribution of more highly educated workers may have to do with their comparative advantage in implementing new technology. Although suggestive, these results still do not tell us precisely what it is that more highly educated workers know and can do better than others. There is also the possibility of spurious relationships due to aggregation: The more productive and technologically progressive firms within an industry may not actually be the ones with the most highly educated personnel.

The best level at which to study the relationship between workers' competence and productivity is the firm, establishment, or work group. These are the actual units of production, where human competence is combined with other factors to produce goods or services (Bishop, 1987). Sorge, Warner, and associates devised a method for comparative case studies of firms, focusing on machine tool making and other manufacturing (Hartmann, Nicholas, Sorge, & Warner, 1983; Maurice, Sorge, & Warner, 1980). They found both higher productivity and higher levels of skills among production workers in Germany compared to France and the United Kingdom.

The comparative case study method was further refined by researchers at the National Institute of Economic and Social Research (NIESR) in London. In a series of studies in different manufacturing industries, they matched firms in different countries by specific product and scale of operation. They then compared the physical productivity of similar work groups, taking into account the kind of machinery being used, its age, country of origin, and method of use. They also noted any differences in raw materials, scheduling of work, and the organization of production. Finally, they documented the levels of vocational qualification of production workers, foremen, and managers.

The first study in the NIESR series, by Daly, Hitchens, and Wagner (1985), compared 16 pairs of British and German plants that produced screws and nuts, small metal springs, drill bits, hydraulic valves, and motor parts. In 6 pairs of firms where the amount of output per person could be compared at the shop floor level, the average productivity of direct labor was 63% higher on the German side. In the larger sample, including these 6 pairs, the age of equipment in the two countries was about the same, but the German firms were using more numerically controlled (NC) machines, and more of the machines used in Germany had been manufactured there, while the British firms mainly used imported machines. There was also less automated feeding of materials into the machines in Britain. Managers in Britain reported more problems with maintenance and machine breakdowns, although no actual statistics on downtime were reported. Differences in employee skill levels were most apparent between British and German foremen: The latter were more likely to possess formal qualifications. The authors conclude, "Although there was a relative lack of NC machinery in the British plans in our sample, in our judgment the greater part of the productivity gap came from other sources: A lack of feeding devices, frequent machine breakdowns, poor maintenance procedures, inadequate control of the quality of raw materials, and similar deficiencies in basic production techniques" (Daly et al., 1985, p. 59). "The fault for poor maintenance, poor production control, and poor diagnosis of faults, has its origins in technical skills at the level of foremen and operators" (Daly et al., 1985, p. 61).

While these conclusions are entirely plausible, it should be noted that the practices described by the researchers might also support a different interpretation, namely, that poor deployment and use of skills, rather than lack of skills, account for at least some of the productivity differences. They describe the British firms as generally sloppier about meeting deadlines, enforcing quality standards for suppliers of materials, keeping machines clean, and doing preventive maintenance. Workers in the British firms may

simply lack incentive to keep machines running properly, and managers may have fallen into the habit of blaming a generally disorganized workplace on workers' alleged ineptitude. It is conceivable that the same workers, under a different management regime, would be capable of the same productivity as in Germany.

The second NIESR study in this series (Steedman & Wagner, 1987) contrasted nine British and eight German manufacturers of wooden kitchen cabinets. At the stage of preparing cabinet panels, output per employee was 2.3 times higher in the German plants, due mainly to the more extensive use of computer numerically controlled (CNC) machines in Germany for feeding and off-loading materials to and from saws and drill presses. Among other reasons for this difference was the greater fear of machine breakdowns in Britain, and in this study the researchers provide evidence to corroborate this fear: "In the course of our visits to nine British furniture plants, five severe problems of major machine malfunction on the main production line were noted; in three, the main production line was undergoing repair in the course of our visit. Not a single instance of breakdown in a main production line was observed in Germany" (Steedman & Wagner, 1987, p. 126). Again, the organization of work in Germany was generally tighter.

Steedman and Wagner (1989) next compared 10 pairs of British and German plants making women's outerwear such as coats, jackets, suits, blouses, skirts, and dresses. As in the previous study, the German firms were producing more specialized products in smaller batches. Restricting the comparison to half the sample that were producing similar batch sizes, the German firms were found to be twice as productive. The British were using somewhat older machines and, again, were experiencing more downtime: "In Britain, one or more of the more complex and major pieces of equipment . . . were not functioning correctly, or at all, in half of all plants visited . . . . None of the German plants visited had breakdowns of this sort, and all major machines were fully functioning" (Steedman & Wagner, 1989, p. 46). The researchers attribute this in large part to the fact that "in the German clothing firms we visited all the mechanics who were servicing sewing and allied machinery had passed engineering apprenticeship examinations, whereas in the British firms visited none had done so" (Steedman & Wagner, 1989, p. 51). In addition, broader initial training of machine operators enabled them to change more quickly from one product to another, an important skill in the fashion industry, where changes in style are frequent.

The fourth and final study in the NIESR series of British-German comparisons left the manufacturing sector to look at hotels. Specifically, Prais, Jarvis, and Wagner (1989) examined 14 British and 24 German medium-quality bed-and-breakfast hotels. Productivity, measured by guest-nights per employee, was twice as high in the German sample. This was again attributed to better training, with more of the German employees holding formal qualifications for their jobs. At reception desks, the broader German training enabled workers to handle a wider range of tasks, thus economizing on the number of people necessary. Better trained housekeepers were also more efficient in organizing the work of chambermaids, who were untrained in both countries.

The NIESR group has subsequently gone on to compare biscuit making in Britain and the Netherlands, with qualitatively similar results (Mason, Prais, &

van Ark, 1990). Despite their limitations and the possibility of alternative interpretations, these are among the most detailed and thorough studies of skill levels and productivity at the level of the firm, and they show consistently positive connections.

However, even the NIESR studies have not directly measured what workers know and are able to do. Instead, the researchers have documented the different schooling qualifications held by workers in the matched firms, and they have described the content of training certified by those qualifications. But they have not pinned down the precise differences in knowledge and skills that caused the observed productivity differences. It is possible that much, or even all, of the additional training of German workers is irrelevant to the functioning of the work group or firm. Conceivably, the whole difference in productivity could be attributable to better management and stronger motivation, rather than actual knowledge and skills. While this explanation seems unlikely, the absence of direct measures of workers' competence leaves the possibility open. It also makes it impossible to tell exactly what, if anything, about the German workers' training makes them more productive.

Potential Benefits of Skills Assessment

Thus, what might be gained from a general survey of workers' knowledge and skills is, first of all, the possibility of directly testing how these are related to productivity. As we have tried to suggest, this kind of information would begin to fill a great void in the research to date. Such information would also begin to create a more solid basis for policy on education and training. Much current policy discussion rests on assumptions about the contribution of education and training to the economy—assumptions that are untestable because the data are lacking.

One specific policy issue has to do with minimum qualifications. Exactly what should a person know and be able to do before being awarded a certificate of initial mastery or other starter qualification? There is no firm basis for answering this question unless and until some evidence has been collected about the relationship between competence and productivity. In the absence of such evidence, the standard might be set too low, leading to reduced productivity in the workplace, or too high, causing some potentially productive individuals to be unnecessarily disqualified.

More generally, the possibility of directly measuring whether and how workers' competence affects productivity could put the whole education and training enterprise on more solid footing. To the extent that specific courses and course requirements are justified because they are thought to prepare students for work, direct evidence about how knowledge and skills affect productivity would allow teachers and curriculum developers to validate what they ask students to learn.

WHAT KIND OF SAMPLES WOULD YIELD THESE BENEFITS?

Direct measurement of workers' competence can shed new light on the relationship between competence and productivity. A number of countries are now beginning to conduct surveys of workers' competence. In order to test the relationship between competence and productivity, the samples for these surveys should be designed to measure both competence and productivity for the same respondents. This implies collecting data in work settings, where productivity can be measured. The primary sampling units should therefore be firms or establishments. Individual workers should then be sampled within enterprises.

Even with such a sample, it is not simple to measure the relationship between workers' competence and the productivity of the enterprise or work group. Productivity can be defined as value added per worker, but both the numerator and denominator of this ratio present tricky issues of definition and measurement. For example, if a work group or enterprise produces goods or services that are not sold but are used by another part of the same firm, it can be difficult to determine the value. In determining the number of workers for computing productivity, it is necessary to decide how to count managers, temporary employees, and ancillary employees. These difficulties are not insurmountable, and the agency conducting the skills survey would not necessarily have to deal with the productivity measures at all: These could be collected in a separate survey effort.

It is important to collect the data on workers' knowledge and skills in such a way that it is at least possible to gather the related productivity evidence for the same workers or a subsample of them. The main alternative to enterprises as primary sampling units would be households, from which individual respondents would be drawn. But the only proxy for productivity available for individuals in a household survey is earnings, and we have already explained why earnings are an unsatisfactory measure of productivity.

Another desirable feature of the sampling design would be to sample clusters of entire work groups within enterprises. In most work settings, the definition of productivity is a group concept. The contribution of individuals depends not only on their own knowledge and skills, but also on those of their coworkers. To some extent even knowledge and skills themselves are embodied in groups rather than individuals (Lave & Wenger, 1991). Therefore, it should be possible to obtain a more accurate explanation of the relationship between workers' competence and productivity if both are measured for complete work groups, so that the use and development of workplace literacy can be understood in relation to social capital (Coleman, 1990) and culture (Hull, 1993). The gain in understanding should be worth the increased complexity of computing standard errors of estimates in cluster samples.

An agency charged with conducting a survey of workers' knowledge and skills might object that we are adding a whole research agenda to a measurement task that is already sufficiently difficult in itself. However, it is our judgment that the sampling design we have sketched here is necessary to answer the

theoretical and practical questions that motivate this kind of survey in the first place. Even if not all of this can be achieved right away, it is useful to be clear about the basic questions in order to see the direction the effort should take.

ACCOMPLISHING THE DESIRED STUDY DESIGN

While the goal should be to develop a means of directly testing how knowledge and skills are related to productivity, a number of hurdles have to be taken before this question can ultimately be addressed in a satisfactorily designed study. The challenges are both conceptual and methodological.

Conceptually, the main task is to establish an acceptable definition of skill and to develop a skill taxonomy. As argued by Wagner (in press), akin to modern theories of intelligence, a skill taxonomy would take account of multiple dimensions, and its structure would acknowledge hierarchy. This research agenda will take many years to carry out, for much the same reasons as the work on human intelligence is incomplete despite more than a century of intensive research.

No less daunting is the task of measuring the independent and dependent variables. Productivity, the dependent variable, can be assessed in terms of the output of an individual worker, the output of a specific workplace or a branch of industry, or the aggregate output of an economy. Insofar as output can be defined in quantitative units and measured under experimental or quasi-experimental conditions, the measurement of productivity seems more straightforward than the measurement and scaling of literacy skills. Studies show that a large and collaborative research program is needed for the development of an adequate methodology for skill assessment (Jones, in press; Murray, in press; Smith & Marsiske, 1994; Van der Kamp, in press). Other challenges include the construction and validation of test measures, the scaling of skill dimensions, and the setting of proficiency benchmarks (Kirsch & Jungeblut, in press; Kolstad, in press; Mohadjer, Berlin, Rieger, & Waksberg, in press; Mosenthal, in press; Venezky, in press).

Once useful definitions and reasonably accurate test measures have been developed, the large problem of data collection arises (Kirsch & Jungeblut, in press; Mohadjer et al., in press). Accomplishing the desired design will necessitate the creation of a multilevel sample of workers clustered within work units, firms or work organizations, labor market sectors and, finally, countries. While technically feasible, no large study relying on so complex a design has been undertaken to date.

A further element should be mentioned. Governments are interested in workplaces that sustain productivity and competitiveness. The implication is that time-series data are required. Unstable relationships might be detected that result from business decisions that were taken to yield tactical advantage but might have negative repercussions for long-term prospects. Similarly, one might see low productivity in the short term that belies a high, long-term

yield as the investment pays off. Thus, in looking for evidence about the relationship between skills and productivity, the time dimension and the reference period for measurement cannot be ignored.

Work is being undertaken on all research fronts, but the progress so far has been uneven. An interesting development is that statistical agencies in a number of OECD countries have created surveys that select workers within firms for the purpose of collecting information on human capital investment and nonwage remuneration. These data are being used to calculate price indices for labor—indices that are free from occupational or industrial shifts. Although the information sources used for these surveys differ from those tapped by a skills study, they can provide a convenient operational infrastructure within which to work. This argues for adopting a gradual approach in working toward the goal of creating the measurement technology that is needed if the relationship between skills and productivity is ever to be estimated using direct observation.

Progress in the area of skill assessment has been especially slow. There are, however, positive signs here as well. In 1992, an important group of OECD countries—including Canada, France, Germany, Ireland, the Netherlands, and the United States—decided to pool resources and expertise to set up the first International Assessment of Literacy Skills (IALS) ever undertaken. If successful, this study will open up exciting possibilities for policy analysis and statistical modeling, because it will produce the first international database with comparable information on variables such as initial schooling, postinitial training, informal learning at the workplace, and information on jobs and the work environment. Most important, it will include the results from nationwide assessments of literacy skills undertaken in nine countries among samples of the population 18 to 64 years of age. A further benefit of the IALS is that it mobilizes the required mix of talents by bringing together researchers, policymakers, assessment and sampling experts, and statistical agencies. These benefits notwithstanding, in some respects the IALS arguably falls short of the kind of design advocated in the present report. The two main handicaps are, first, the absence of a multilevel sampling design that targets work units within firms and, second, the absence of productivity measures.

However, the aim of the study is not to test the hypothesis of a positive or negative relationship between skills and productivity. This first international study seeks to accomplish four main tasks, all of them difficult but necessary for achieving progress in this field of study. The first task is to establish an international procedure for measuring and assessing literacy skills in a comparative context. The second aim is to develop an international scale, so that the skill levels observed in one country can be related to benchmarks estimated using data obtained from other countries. The third aim is to investigate the relationship between literacy proficiency, schooling, postinitial training, and learning in the workplace. Finally, once the assessment results are available and have been calibrated on an international scale, the study will seek to profile the literacy proficiency of designated groups in nested structures, for example, the long-term unemployed or the workers in certain occupations and sectors of the labor market.

The first IALS, now under way, is not designed to take the research forward on all fronts. However, by improving our knowledge and understanding of literacy and by developing an international methodology for its measurement and assessment, the study brings us a step closer to the ultimate

goal, the testing of the hypotheses asserting that schooling, further education, and training determine worker skills and that skills in large measure codetermine, first, the productivity of workers and work organizations and, second, the competitiveness of nations.

CONCLUSION

Current changes signaling a transition from a labor- to a knowledge-intensive system of wealth creation make it all the more important to increase the efficient allocation of both the quantity and the flow of human-embodied knowledge and literacy skills.

Surveys involving the assessment of literacy skills, while not sufficient by themselves, at least offer the prospect of improving the methodology of analyzing acquired skills and competencies. The benefit of increased understanding is likely to be greater allocative efficiency through enhanced information.

Comparative surveys of adult literacy skills can offer baseline information for use in a future human capital accounting system that, by offering additional insights into costs, risks, rates of return, and incentives will offer improved signals and information for investment decision making.

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